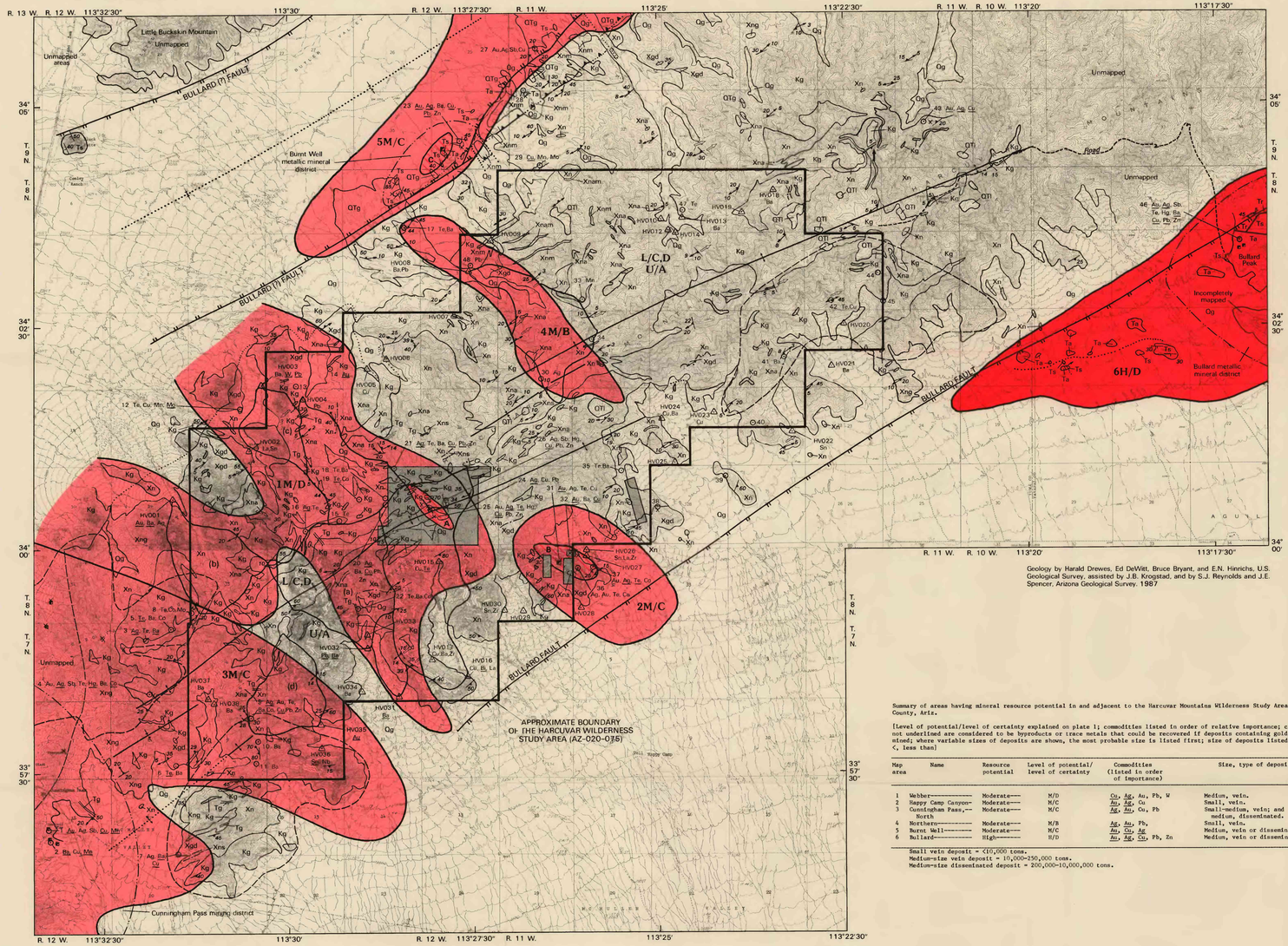
DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

BULLETIN 1701–F
PLATE 1



Summary of areas having mineral resource potential in and adjacent to the Harcuvar Mountains Wilderness Study Area, La Paz County, Ariz.

[Level of potential/level of certainty explained on plate 1; commodities listed in order of relative importance; commodities not underlined are considered to be byproducts or trace metals that could be recovered if deposits containing gold were mined; where variable sizes of deposits are shown, the most probable size is listed first; size of deposits listed below, <, less than]

Map area	Name	Resource potential	Level of potential/ level of certainty	Commodities (listed in order of importance)	Size, type of deposit
1	Webber	Moderate	M/D	Cu, Ag, Au, Pb, W	Medium, vein.
2	Happy Camp Canyon	Moderate	M/C	Au, Ag, Cu	Small, vein.
3	Cunningham Pass, North	Moderate	M/C	Ag, Au, Cu, Pb	Small–medium, vein; and medium, disseminated.
4	Northern	Moderate	M/B	Ag, Au, Pb,	Small, vein.
5	Burnt Well	Moderate	M/C	Au, Cu, Ag	Medium, vein or disseminated.
6	Bullard	High	H/D	Au, Ag, Cu, Pb, Zn	Medium, vein or disseminated.

Small vein deposit = <10,000 tons.
Medium-size vein deposit = 10,000–250,000 tons.
Medium-size disseminated deposit = 200,000–10,000,000 tons.

EXPLANATION OF IDENTIFIED RESOURCES AND MINERAL RESOURCE POTENTIAL WITHIN AND OUTSIDE THE STUDY AREA

[No terrane having high mineral resource potential for any commodity was identified within the study area]

A — **Areas having identified mineral resource**—Letters refer to areas listed here and in table on plate
A. Copper
B. Gold, copper
C. Copper, gold

6H/D — **Geologic terrane having high resource potential with certainty level D**—Number prefix refers to area listed here and in table 3. Numbered area may surround lettered areas; if so, lettered area has the same resource potential as numbered area

4M/B, 2,3,5 M/C, 1M/D — **Geologic terrane having moderate resource potential with certainty levels B, C, or D**—Number prefixes refer to areas listed in table here and in table 3. Numbered areas may surround lettered areas; if so, lettered area has the same resource potential as the numbered area. These areas constitute about 36 percent of the study area. Area 5 is outside the study area

L/C,D — **Geologic terrane having low resource potential with certainty level C or D**—
For the entire area:
Copper, lead, zinc, gold, and silver in massive sulfide deposits (certainty level D)
Rare-earth minerals, feldspar, and mica in pegmatites (certainty level D)
Industrial rocks and minerals, decorative and ornamental stone, and geothermal resources (certainty level D)
Oil, gas, coal, sand and gravel, and deposits of placer gold (certainty level C)

U/A — **Geologic terrane having unknown resource potential with certainty level A**—Gold in small to medium-size disseminated deposits; applies to entire study area except as otherwise noted

Levels of certainty

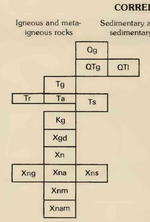
A — **Available data not adequate to estimate potential**

B — **Data indicate geologic environment and suggest level of resource potential**

C — **Data indicate geologic environment and give good indication of level of resource potential, but do not establish activity of resource-forming process**

D — **Data clearly define geologic environment and level of resource potential and indicate activity of resource-forming processes in all or part of the area**

CORRELATION OF MAP UNITS



DESCRIPTION OF MAP UNITS

Surficial deposits

Qg — **Gravel and sand (Holocene and Pleistocene)**—Moderately sorted, boulder to pebble gravel and beds of sand, generally unindurated but locally indurated by caliche; light-gray to light-brownish-gray alluvium deposited along watercourses, on stream terraces and alluvial aprons. Includes colluvium and, in valleys, also some eolian material

QTg — **Gravel and sand (Pleistocene and Pliocene?)**—Moderately sorted cobble to pebble gravel and sand beds; slightly indurated alluvium deposited on highest terrace and a high-level fan apron north of the mountains

QTl — **Landslide deposit (Pleistocene and Pliocene?)**—Locally derived blocks several feet to tens of feet across, typically rotated, slumped, and capped by a terrace or sag feature, and, in a few instances, separated from material upslope by a fracture zone that has many open cavities extending to about 10 ft below the surface

Rocks of upper plate of Bullard detachment fault

Tr — **Rhyolite (Miocene)**—Light-gray, fine-grained, crystal-lithic, welded tuff, probably K-metasomatized, near Bullard Peak

Ta — **Andesite (Miocene)**—Medium-gray, fine-grained to porphyritic rock, some vesicular and amygdular, weathering to dark brown with heavy cover of desert varnish. Phenocrysts of plagioclase and amphibole; moderately propylitized and probably K-metasomatized

Ts — **Sedimentary rocks (Miocene and Oligocene?)**—Dark-brown to reddish-brown conglomerate and sandstone, very pale orange to pale-yellowish-brown shale and minor limestone and tuffaceous beds. Conglomerate clasts typically smaller and better rounded than those of younger alluvial deposits. Some conglomerates contain abundant detritus of andesite or rhyolite derived from volcanic rock such as occur in units Ta and Tr

Rocks of lower plate of Bullard detachment fault

Tg — **Microgabbro (Miocene)**—Dark-gray, fine- to medium-grained dikes, either undeformed or strongly mylonitized. Contains variable proportions of hornblende, altered plagioclase, epidote, biotite, quartz, and minor amounts of magnetite, apatite, and sphene

Kg — **Granite of Tank Pass (Upper Cretaceous)**—Light-gray to pale-yellowish-brown, medium-grained, equigranular, slightly flow-foliated, peraluminous biotite-muscovite granite. Mostly weathers to slabby outcrops and friable detritus, but locally makes bold outcrops or cliffs. Mylonitized along highest part of range, in northeast part of range, and in proximity to Bullard detachment fault. Contains about equal amounts of quartz, oligoclase, and microcline; lesser amounts of biotite, muscovite, manganese-rich garnet; and trace amounts of ilmenite, apatite, zircon, sphene, and allanite

Xgd — **Granodiorite to granite (Early Proterozoic)**—Coarsely porphyritic, dark-gray, slightly deformed to intensely foliated granodiorite to granite. Phenocrysts as much as 1 in. long of potassium feldspar in matrix of plagioclase, microcline, quartz, biotite, minor epidote, sericite, and trace amounts of magnetite, apatite, and zircon. Weathers to blocky or rounded outcrops

Xn — **Gneiss (Early Proterozoic)**—Undivided amphibolite, pelitic schist, and granite gneiss. Includes small bodies of migmatite. Distinct layered appearance due to compositional variation of rock types. Weathers mostly to gentle slopes or small irregular cliffs but locally to rugged craggy spurs. Divided into various rock types where observed but not separately mapped. All rock types are mylonitized along highest part of range, in northeast part of range, and near Bullard detachment fault

Xng — **Granite gneiss (Early Proterozoic)**—Light-gray, medium-grained, equigranular granite to granodiorite. Highly foliated to gneissic. Weathers to nonresistant outcrops. Contains microcline, plagioclase, quartz, biotite, muscovite, and minor epidote, apatite, and zircon

Xna — **Amphibolite (Early Proterozoic)**—Fine- to coarse-grained, dark-gray to dark-green, foliated, compositionally banded to homogeneous amphibolite. Present as various lens-like, tabular, or irregular-shaped masses whose contacts with pelitic schist and granite gneiss are either sharp or gradational. Consists of hornblende, plagioclase, quartz, biotite, epidote, sphene, and minor zircon

Xns — **Pelitic schist (Early Proterozoic)**—Light-gray, fine- to medium-grained muscovite-biotite schist. Contains muscovite, biotite, plagioclase, quartz, garnet, and very minor sillimanite

Xnm — **Mylonitic gneiss (Early Proterozoic)**—Dark-gray, fine-grained granitic, granodioritic, and micaceous rocks; some contain small angular fragments of phenocrysts and have strongly sheared or mylonitized foliation surfaces. Generally forms thin, sheet-like bodies parallel to mylonitic foliation

Xnam — **Mylonitic amphibolite (Early Proterozoic)**—Dark-gray to dark-green, fine-grained mylonitic amphibolite containing coarser grained amphibole in a matrix of finer grained plagioclase, quartz, epidote, and biotite

Contact—Dotted where concealed

Marker horizon—Typically used to locally separate areas containing diverse rock types within gneiss

Fault—Showing dip. Dotted where concealed, queried where projected far from controls

Normal fault—Ball and bar on downthrown side

Thrust(?) fault—Solid sawteeth on upper plate

Low-angle normal fault—Open sawteeth on upper plate. Movement of upper plate inferred to be to the northeast

Strike-slip fault—Arrows show relative direction of movement

Fold—Axis of fold in foliation. Dotted where concealed

Antiform

Synform

Strike and dip of beds

Strike and dip of foliation—Arrow shows direction of lineation in plane of foliation and approximate plunge of mylonitic lineation. Ball and bar shows direction and approximate plunge of older crystalloblastic lineation. Arrowheads or dots on both ends of strike line indicate horizontal lineation. (Generally only one or the other lineation present)

Direction of tectonic transport—Direction of movement of upper mass relative to lower mass, as obtained from fabric features

Mining district (Keith, 1978) or metallic mineral district (Keith and others, 1983)

Unpatented mining claim (shown only in the Wilderness Study Area itself)

Shaft

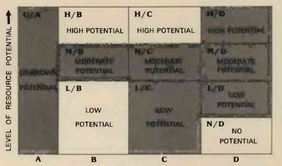
Prospect pit

Adit

HV027 Ag, Cu (a) — **Stream-sediment and panned concentrate sample locality and number**—Elements present in anomalous concentrations are listed with sample number; highly anomalous concentrations are underlined. See table 1 for concentrations. Thin solid line above some sampling sites is drainage basin outline for that sample. Letters in parentheses refer to drainage basins discussed in text

5 Te, Co — **Rock-chip sample locality and number**— Elements present in anomalous concentrations are listed with sample number; see table 2 for concentrations. Elements present in highly anomalous concentrations listed with sample number are underlined

Areas inferred to contain anomalous concentrations of iron-oxide-rich minerals (such as hematite, limonite) or hydroxyl-rich minerals (micas, clays), as evidenced from Landsat Thematic Mapper (TM) imagery



LEVELS OF RESOURCE POTENTIAL

- **H** High mineral resource potential
- **M** Moderate mineral resource potential
- **L** Low mineral resource potential
- **U** Unknown mineral resource potential
- **N** No known mineral resource potential

LEVELS OF CERTAINTY

- **A** Available data not adequate
- **B** Data indicate geologic environment and suggest level of resource potential
- **C** Data indicate geologic environment, give good indication of level of resource potential, but do not establish activity of resource-forming processes
- **D** Data clearly define geologic environment and level of resource potential and indicate activity of resource-forming processes in all or part of the area

Diagram showing relationships between levels of mineral resource potential and levels of certainty. Shading shows levels that apply to this study area

MAP SHOWING IDENTIFIED RESOURCES, MINERAL RESOURCE POTENTIAL, GEOLOGY, AND SAMPLE SITES FOR THE HARCUVAR MOUNTAINS WILDERNESS STUDY AREA, LA PAZ COUNTY, ARIZONA